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VO, QUANG N	

ART UNIT	PAPER NUMBER
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NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/698,895	DAMERA-VENKATA, NIRANJAN	
	Examiner	**Art Unit**	
	Quang N. Vo	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 April 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Regarding claim 1, Applicant's argument is Kumar does not disclose processing the output through a data processing path having a bandpass transfer characteristic.

In response: Kumar discloses processing the output through a data processing path having a bandpass transfer characteristic (e.g., error filter h4 having prominent bandpass shape at horizontal and vertical frequencies, page 1287; error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph).

Applicant's arguments, see Remarks, filed 4/07/09 with respect to the rejection(s) of claim(s) 3-4, 8, 10-11, and 15-20,24 under *35 USC § 101* have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kumar et al. (On the Phase Response of the Error Diffusion Filter for Image Halftoning, September 1999).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 4, 6-7, 9, 11, 13-14, 21, 23 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Kumar et al. (Kumar) (On the Phase Response of the Error Diffusion Filter for Image Halftoning, September 1999).

Regarding claim 1, Kumar discloses an error diffusion halftoning method (e.g., error diffusion method, figure 1) comprising operating a processor (e.g., display devices/printers (processor), Introduction, page 1282) to perform operations comprising: modifying a current input to produce a modified input (e.g., converting a gray tone f(i, j) to y(i, j) (modified input), figure 1, paragraph I), wherein the modifying comprises incorporating past quantization errors into the current input (e.g., past errors d(i, j) into f(i, j) to have modified input y(i, j), figure 1, paragraph I); quantizing the modified input to produce an output (e.g., converting y(i, j) (modified input) to a binary value g(i, j) for output, figure 1, paragraph I); and processing the output through a data processing path having a bandpass transfer characteristic (e.g., error filter h4 having prominent bandpass shape at horizontal and vertical frequencies, page 1287; error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph), wherein the processing comprises deriving an error value (e.g., error value e(i, j), figure 1) from the modified input (e.g., modified input y(i, j), figure 1) and the output and diffusing the error value into future inputs (e.g., diffusing the error value d(i, j) into future inputs f(i, j), figure 1).

Regarding claim 2, Kumar discloses wherein the processing comprises shaping quanfization noise in the output in accordance with the bandpass transfer characteristic (e.g., the resulting halftoning noise does get shaped in a desirable way; the halftoning

noise spectrum is shaped by 1-H(w(x), w(y)), Proposed Algorithm and Halftoning Noise in Error Diffusion, page 1283).

Regarding claim 4, Kumar discloses wherein coefficients of the transfer functions H(z) and K(z) sum to unity at dc and the bandpass transfer function has a mean-preserving behavior (e.g., If the magnitude response of the error filter is lowpass with unity gain at zero frequency, Magnitude Versus Phase, pages1284, 1289).

Regarding claim 6, Kumar disclose wherein the processing comprises bandpass filtering the error value into future inputs (e.g., error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph).

<u>Referring to claim 7</u>:

Claim 7 is the apparatus claim corresponding to method step in claim 1 with functional steps corresponding directly to the method step elements in claim 1. Therefore claim 7 is rejected as set forth above for claim 1.

<u>Referring to claim 9</u>:

Claim 9 is the apparatus claim corresponding to method step in claim 1 with functional steps corresponding directly to the method step elements in claim 1. Therefore claim 9 is rejected as set forth above for claim 1.

<u>Referring to claim 11</u>:

Claim 11 is the apparatus claim corresponding to method step in claim 4 with functional steps corresponding directly to the method step elements in claim 4. Therefore claim 11 is rejected as set forth above for claim 4.

Referring to claim 13:

Claim 13 is the apparatus claim corresponding to method step in claim 6 with functional steps corresponding directly to the method step elements in claim 6. Therefore claim 13 is rejected as set forth above for claim 6.

Referring to claim 14:

Claim 14 is the apparatus claim corresponding to method step in claim 2 with functional steps corresponding directly to the method step elements in claim 2. Therefore claim 14 is rejected as set forth above for claim 2.

Regarding claim 21, Kumar discloses a printer comprising: a print engine; and a processor (e.g., printer/display (inherently having print engine and processor), page 1282) for performing error diffusion halftoning (e.g., error diffusion method, figure 1), the halftoning including performing quantization (e.g., quantizer, figure 1), and using an error signal filtered with an effective bandpass characteristic to influence the quantization without using a result of the quantization to directly influence an input of the quantization characteristic (e.g., error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph), an output of the quantization supplied to the print engine (e.g., binary output g(i, j) supplied to the print engine, figure 1).

Regarding claim 23, Kumar discloses wherein the modifying comprises incorporating into the current input (e.g., x(n1, n2), figure 2) the past quantization errors filtered in accordance with a bandpass filter transfer function (e.g., error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the

human visual system, figure1, page 1285, third paragraph) to produce the modified input (e.g., past errors d(i, j) into f(i, j) to have modified input y(i, j), figure 1, paragraph I), and subtracting the modified input (e.g., modified input y(i, j), figure 1) from the output (e.g., output g(i, j), figure 1) to produce the error value (e.g., error e(i, j), figure 1).

Regarding claim 25, Kumar discloses wherein the processor (e.g., printer/display (inherently have processor), page 1282) is operable to perform operations comprising: modifying a current input (e.g., current input f(i, j), figure 1) to produce a modified input (e.g., modified input y(i, j), figure 1), wherein the modifying comprises incorporating past quantization errors into the current input (e.g., quantization errors d(i, j), figure 1); quantizing the modified input to produce an output (e.g., output g(i, j), figure 1); and processing the output through a data processing path having a bandpass transfer characteristic (e.g., error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph), wherein the processing comprises deriving an error value from the modified input and the output and diffusing the error value into future inputs (e.g., diffusing the error value d(i, j) into future inputs f(i, j), figure 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 8, 10, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (Kumar) (On the Phase Response of the Error Diffusion Filter for Image Halftoning, September 1999).

Regarding claim 3, Kumar discloses wherein the bandpass transfer characteristic has a response that corresponds to a bandpass transfer function B(z) (e.g., error filter h4 having prominent bandpass shape at horizontal and vertical frequencies, page 1287).

Kumar does not defined explicitly B(z) = ((1-alpha)H(z) + alphaH(z)K(z)) / (1-alphaH(z) + alphaH(z)K(z)).

Since Kumar discloses the response of the error filter determines which part of the input image spectrum is retained by the halftoning method, and which part is not (page 1284) and error filter h4 having prominent bandpass shape at horizontal and vertical frequencies, page 1287. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have recognized Kumar disclosing wherein the bandpass transfer characteristic has a response that corresponds to a bandpass transfer function B(z) as claimed in claim 3.

Claims 8, 10 and 17 have similar subject matter as claim 3. Therefore claims 8, 10 and 17 are rejected as set forth above for claim 3.

Claims 5, 12, 15-16, 18-20, 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (Kumar) (On the Phase Response of the Error Diffusion Filter for Image Halftoning, September 1999) as applied to claim 1 above, and further in view of Shimizu (US 6,999,201).

Regarding claim 5, Kumar does not explicitly disclose generating second error value based on the filtered output and the modified input and low pass filtering the second error value with a second linear weighting filter to produce the first error value.

Shimizu disclose generating second error value (e.g., w(n1,n2), figure 2) based on the filtered output (e.g., g(n1,n2), figure 2) and the modified input (e.g., modified input at 215, figure 2) and low pass filtering the second error value with a second linear weighting filter (e.g., weight coefficient lamda block 280 and associated with adaptive algorithm block 270, figure 2. Note: weight coefficient associated with adaptive algorithm to produce the quantization error e(n1, n2). Thus it is considered as second linear weighting filter) to produce the first error value (e.g., e(n1, n2) at 285, figure 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar to include generating second error value based on the filtered output and the modified input and low pass filtering the second error value with a second linear weighting filter to produce the first error value as taught by Shimizu. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar by the teaching of Shimizu to obtain more accurate error values for error diffusion processing.

<u>Referring to claim 12</u>:

Claim 12 is the apparatus claim corresponding to method step in claim 5 with functional steps corresponding directly to the method step elements in claim 5. Therefore claim 12 is rejected as set forth above for claim 5.

Regarding claim 15, Kumar discloses a processor (e.g., printer/display (inherently having processor), page 1282) to perform error diffusion halftoning (e.g., error diffusion method, figure 1), the error diffusion halftoning including performing quantization (e.g., quantizer, figure 1), and filtering (e.g., error filter, figure 1) with an effective bandpass characteristic without using an output of the quantization to directly influence an input of the quantization (e.g., error filter h(k, l) (transfer function) with preferably with its pass band not less than the passband of the human visual system, figure1, page 1285, third paragraph).

Kumar does not explicitly disclose a machine-readable memory storing processor-readable instructions that, when executed by a processor, causes the processor to perform error diffusion halftoning.

Shimizu disclose a machine-readable memory storing processor-readable instructions that, when executed by a processor, causes the processor to perform error diffusion halftoning (e.g., the processing for this invention can be carried out by a computer program. This computer program can be executed by a computer system shown in FIG. 12).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar to include a machine-readable memory storing processor-readable instructions that, when executed by a processor, causes the processor to perform error diffusion halftoning as taught by Shimizu. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified

Kumar by the teaching of Shimizu to conveniently process error diffusion halftoning from software program.

Regarding claim 16, Kumar discloses wherein the filtered error signal is used to modify the quantization input (e.g., Error filter used to modify y(i, j), figure 1).

Regarding claim 18, Kumar discloses wherein coefficients of the transfer functions H(z) and K(z) sum to unity at dc (e.g., If the magnitude response of the error filter is lowpass with unity gain at zero frequency, Magnitude Versus Phase, pages1284, 1289).

Regarding claim 19, Kumar differs from claim 19 in that he does not explicitly disclose and low pass filtering the error signal with a second linear weighting filter.

Shimizu discloses low pass filtering the error signal with a second linear weighting filter (e.g., weight coefficient lamda block 280 and associated with adaptive algorithm block 270, figure 2. Note: weight coefficient associated with adaptive algorithm to produce the quantization error e(n1, n2). Thus it is considered as second linear weighting filter).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar to include low pass filtering the error signal with a second linear weighting filter as taught by Shimizu. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar by the teaching of Shimizu to obtain more accurate error values for error diffusion processing.

Regarding claim 20, Kumar discloses generating an error from the quantization input and output (e.g., error e(i, j) generating from y(i, j) and g(i, j), figure 1); and applying an infinite impulse response filter to the error signal (e.g., error filter to error signal e(i, j), figure 1, an output of the infinite impulse response filter used to modify the quantization input (e.g., output from error filter d(i, j) to y(i, j), figure 1).

Regarding claim 22, Kumar differs from claim 22 in that he does not disclose subtracting the modified input from the modified output to produce a second error value filtering the second error value in accordance with a second low-pass filter transfer function to produce the first error value; and

the modifying comprises incorporating into the current input past error values filtered in accordance with the second low-pass filter transfer function to produce the modified input.

Shimizu discloses subtracting the modified input (e.g., modified input at 215, figure 2) from the modified output (e.g., g(n1, n2) or value at 245, figure 2) to produce a second error value (e.g., w(n1,n2), figure 2) filtering the second error value in accordance with a second low-pass filter transfer function to produce the first error value (e.g., weight coefficient lamda block 280 and associated with adaptive algorithm block 270, figure 2. Note: weight coefficient associated with adaptive algorithm to produce the quantization error e(n1, n2). Thus it is considered as second linear weighting filter) to produce the first error value (e.g., e(n1, n2) at 285, figure 2); and the modifying comprises incorporating into the current input (e.g., current input x(n1, n2), figure 2) past error values filtered (e.g., e(n1, n2) at 285, figure 2) in accordance with

the second low-pass filter transfer function to produce the modified input (e.g., modified input at 215, figure 2).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar to include subtracting the modified input from the modified output to produce a second error value filtering the second error value in accordance with a second low-pass filter transfer function to produce the first error value; and the modifying comprises incorporating into the current input past error values filtered in accordance with the second low-pass filter transfer function to produce the modified input as taught by Shimizu. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar by the teaching of Shimizu to obtain more accurate error values for error diffusion processing.

Regarding claim 24, Kumar differs from claim 24 in that he does not disclose the machine readable medium stores processor readable instructions causing the processor to perform error diffusion operations.

Shimizu discloses the machine readable medium stores processor readable instructions causing the processor to perform error diffusion operations (e.g., The processing for this invention can be carried out by a computer program. This computer program can be executed by a computer system shown in FIG. 12).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Kumar to include the machine readable medium stores processor readable instructions causing the processor to perform error diffusion operations as taught by Shimizu. It would have been obvious to one of ordinary skill in

the art at the time of the invention to have modified Kumar by the teaching of Shimizu to conveniently process error diffusion halftoning from software program.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quang N. Vo whose telephone number is (571)270-1121. The examiner can normally be reached on 7:30AM-5:00PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571)272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Q. N. V./
Examiner, Art Unit 2625

/David K Moore/
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